

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1 to 9 in the underlying PCT Application No. PCT/EP2005/000792 and adds new claims 10 to 21. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and does not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/EP2005/000792 includes an International Search Report, dated March 16, 2005, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

Dated: August 9, 2006

By: 
Clifford A. Ulrich
Reg. No. 42,194

KENYON & KENYON LLP
One Broadway
New York, New York 10004
(212) 425-7200
CUSTOMER NO. 26646

METHOD AND DEVICE FOR ACTIVATING AN ELECTRIC PARKING BRAKE

FIELD OF THE INVENTION

The present invention relates to a method and a device for activating an electric parking brake of a motor vehicle, in particular e.g., a road motor vehicle.

5

BACKGROUND INFORMATION

From ~~DE~~ German Published Patent Application No. 198 38 886 A1 describes an electric immobilizing brake or parking brake for a vehicle ~~is known~~. The driver of the motor vehicle activates
10 the electric parking brake via a push-button switch, for example. The parking brake ~~ensures~~ provides that the vehicle is no longer able to move in the stopped or parked state. To achieve the immobilizing braking effect, it is possible, for instance example, to control the parking brake's wheel brakes
15 ~~situated~~ arranged on the wheels of the motor vehicle by electromotor/transmission units designed to self-lock. This realizes provides the effect of a conventional mechanical immobilization brake.

20 Activation of the electric parking brake requires electric energy, which can be drawn from the vehicle electrical system. When turning off or parking the motor vehicle, in particular on inclines, it is important that the electrical energy is available at all times. Otherwise it may happen that the
25 vehicle is not reliably protected from unintended rolling. Dangerous situations may occur as a result, in particular in motor vehicles in which the mechanical power of the drive motor is additionally utilized to activate a service brake of the motor vehicle. If after shut-down of the drive motor the
30 electrical energy in such vehicles is no longer sufficient to restart the drive motor, the vehicle is no longer fully controllable.

To avoid such situations, ~~DE~~ German Published Patent
Application No. 198 38 886 A1 ~~proposed~~ describes to provide an
auxiliary battery whose energy, as a minimum, is sufficient to
5 activate the parking brake. Disadvantageous in an auxiliary
battery provided in addition to the battery of the vehicle
electrical system is the effort and expense it entails with
regard to construction and production. Also, it is possible
once again that the auxiliary battery will no longer have
10 sufficient energy or is unable to store sufficient energy.

SUMMARY

~~It is an object~~ Example embodiments of the present invention
to provide a method and a device for activating an electric
15 parking brake of a motor vehicle, which may allow reliable
stopping of the motor vehicle during parking.

~~The subject matters of the independent Claims 1 and 6~~
~~constitute achievements of this objective. Advantageous~~
20 ~~further developments are indicated in the respective dependent~~
~~claims.~~

According to an ~~essential idea~~ example embodiment of the
present invention, a drive motor of the motor vehicle is to be
25 turned off only after activation of the electric parking brake
when parking the motor vehicle. In this way manner, the
mechanical energy of the drive motor may still be used for the
activation, ~~in particular~~ e.g., by the drive motor driving a
generator and using for the activation the electrical energy
30 produced by the generator. This allows the motor vehicle to
be parked securely even when the energy store of the vehicle
electrical system is low.

It is ~~expediently~~ may be detected that the shut-down operation
35 is initiated, and the parking brake is activated subsequently.

For ~~instance~~ example, it is possible to monitor whether the vehicle driver gives a signal for turning off an ignition system of an internal combustion engine. The turn-off is implemented only when the parking brake is activated.

5

~~In particular~~ For example, when a generator mechanically coupled to the drive motor is used to generate electrical energy, no modifications with respect to conventional electrical wiring systems of motor vehicles ~~will~~ may be required. ~~Specifically~~ For example, no auxiliary battery ~~is~~ may be necessary to activate the electric parking brake. Instead, ~~the present invention may be realized solely by~~ appropriate ~~design~~ arrangement of the control devices in the motor vehicle may be sufficient.

15

A device for activating the electric parking brake has, for ~~instance~~ example, an activation device for generating an activation signal that activates the electric parking brake. ~~According to the present invention, the~~ The activation device may, ~~in particular~~ for example, generate the activation signal automatically, especially e.g., when the motor vehicle is being parked. To this end, a detection device for detecting the initiation of the parking operation is provided. In a ~~development~~ an example embodiment of the detection device, it detects the initiation of a shut-down operation for turning the drive motor off. If a conventional ignition lock with ignition key is provided, for example, the vehicle driver turns the ignition key to the "off" position in order to shut down the drive motor. However, the vehicle driver may also give a signal for shutting down the drive motor in some other manner, for ~~instance~~ example, by activating an electric push-button switch.

Furthermore, an engine-control device for controlling the shut-down operation is provided in the device. The detection

device is connected to the engine-control device and to the activation device. The activation device and the engine control device are ~~designed~~ arranged and combined with each other ~~in~~ such a way that, once of the shut-down operation has
5 been initiated, the activation signal activates the electric parking brake first, the operation of the drive motor being maintained in the meantime, and the drive motor being turned off only afterwards.

10 It is possible to provide a higher-level control device, which controls the sequence of actions of the engine-control device and the activation device. This higher-level control device may also assume additional tasks such as detecting the initiation of the shut-down operation (i.e., it includes the
15 detection device) and/or additional determinations and/or detections, which will be addressed in more detail ~~later on~~ below and on the basis of whose results a decision is made as to whether the drive motor will be utilized to activate the electric parking brake.

20 The engine-control device, the activation device and/or the detection device may also be integrated in a shared control device. This ~~case~~ is encompassed ~~by the wording~~ in that the devices are interconnected.

25 Although it is possible to shut down the drive motor during each parking operation only after the parking brake has been activated, it ~~is preferred~~ may be provided that this be made dependent on one or more of the following criteria:

30 - The operating state of an electrical energy supply of the motor vehicle. ~~In particular~~ For example, a loading state of an energy store of the energy supply is ascertained and/or it is determined
35 whether the energy store is defective. To this end,

an operating-state device for determining the operating state may be provided in the aforementioned device, the operating-state device being coupled to the engine-control device.

5

- An angle of inclination of the motor vehicle. This criterion is considered satisfied, for instance example, when the amount of the angle of inclination is greater than or equal to 8°. With respect to the angle of inclination, it may be differentiated between the roll angle (measured in a plane transversely to the vehicle's longitudinal axis) and the pitch angle (measured in a plane that includes the vehicle's longitudinal axis). Preferably For example, solely the pitch angle is considered in the decision as to whether the method ~~according to the present invention~~ will be implemented. A detection device for ascertaining the angle of inclination may be provided in the aforementioned device, the detection device being coupled to the engine-control device.

20

- Standstill of the motor vehicle. ~~In particular~~ For example, it is determined whether all wheels of the motor vehicle are stopped. Signals from rpm sensors, for example, may be analyzed for this purpose. Rpm sensors ~~have the advantage of~~ may normally ~~being~~ be present in motor vehicles anyway, for instance example, in connection with an anti-lock braking system.

25

30

The automatic activation of the parking brake with a subsequent shut-down of the drive motor may thus be made dependent on whether the operating state of the electric energy supply requires it, whether the motor vehicle is to be

35

parked at an angle of inclination that is greater than a minimum angle of inclination, and/or whether the vehicle is at a standstill. In this ~~way the present invention carries out its manner,~~ safety ~~function~~ functions are performed only when
5 required, and the functionality is not ~~conceived~~ considered as distracting. After parking on level terrain, for example, the motor vehicle is thus able to be moved without renewed startup of the drive motor.

10 The activation of the electric parking brake ~~according to the present invention~~ may be implemented in a variety of ways manners. For ~~instance~~ example, the operation of the drive motor may be maintained for a period of time having a defined length and starting with the initiation of the shut-down
15 operation and/or the receipt of a corresponding shut-down signal for turning the drive motor off. As an alternative, it is possible, for ~~instance~~ example, to first determine whether the parking brake was activated and only then to generate a signal that effects the shut-down of the drive motor. With
20 the first option, it ~~has been shown to~~ may be sufficient to maintain the operation of the drive motor over a period of time that lasts at least one second.

The Example embodiments of the present invention ~~is elucidated~~
25 ~~in the following on the basis of a preferred exemplary embodiment~~ are described in more detail below with reference to the appended Figures.

~~The figures show:~~

30 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic representation of a system in a road motor vehicle having an electrical energy supply and including control devices that allow an implementation of the a method according to example embodiments of the present invention,
35 and.

Fig. 2 is a time diagram in simplified form, which ~~shows~~
illustrates the chronology of different actions and events in
the execution of the method according to example embodiments
5 of the present invention.

DETAILED DESCRIPTION

Motor vehicle 1, schematically ~~shown~~ illustrated in Fig. 1
within a rectangular frame, has a drive motor 3, which during
10 its operation drives a generator 6 via a mechanical coupling
4. The electrical energy generated by generator 6 is fed into
a vehicle electrical system 5, which has at least one energy
store for storing electrical energy, ~~in particular~~ e.g., a
conventional vehicle battery. Vehicle electrical system 5 is
15 connected to a battery state device 8 (such as a control
device for a vehicle electrical system), which is able to
determine a charge state of energy store 7, ~~in particular~~ for
example. A corresponding result of this determination is
transmitted to a control device 14 of an electric parking
20 brake (EPB control device in the following text), continuously
and/or as required.

Drive motor 3 ~~in the exemplary embodiment is~~ may be an
internal combustion engine, which ~~can~~ may be turned off and on
25 by activating an ignition switch 12. Ignition switch 12 is
connected to an engine control device 10, which ~~in turn~~ is
connected to drive motor 3. In this way manner, engine
control device 10 is able to actually take the switching state
of ignition switch 12 into account, but not implement a
30 corresponding action directly (i.e., without a time delay).
Instead, engine control device 10 may maintain the operation
of drive motor 3 as a function of signals it receives from EPB
control device 14, notwithstanding ~~the fact~~ that the ignition
switch ~~was~~ is turned to the "off" position. It is also
35 possible that engine control device 10 decides on its own

whether and/or for how long the operation of drive motor 3 will be maintained.

A separate rpm sensor 15 is ~~shown~~ illustrated in the region of
5 the four corners of the rectangular frame in Fig. 1, which is assigned to one of the four wheels of motor vehicle 1 in each case instance. In this way manner, a movement device 16 (which has a wheel speed evaluator, ~~in-particular~~ for example) is able to record the rotational wheel speeds of all four
10 wheels. Movement device 16, ~~in-particular~~ for example, is able to determine whether all four wheels -- and thus vehicle 1 -- are/is at a standstill. Movement device 16 is connected to EPB control device 14, so that EPB control device 14 receives a signal from movement device 16, continually and/or
15 as required, and it is possible to determine from the signal whether the vehicle is stopped.

Furthermore, a detection device 18 is provided, which ascertains an angle of inclination of motor vehicle 1,
20 preferably e.g., the amount of a pitch angle. A corresponding signal is transmitted to EPB control device 14 on a continuous basis and/or as required.

An example of an operation of the system ~~shown~~ illustrated in
25 Fig. 1 ~~will now be~~ is explained in greater detail with reference to Fig. 2.

First of all, it is assumed that energy store 7 of vehicle electrical system 5 is in a fully functional operating state,
30 i.e., in particular is sufficiently charged to activate an electric parking brake, ~~which is not shown further in Fig. 1.~~ The activation, with the aid of electrical energy from the vehicle electrical system, may be carried out as described in
DE German Published Patent Application No. 198 38 886 A1, for
35 example, whereas the generation of a corresponding activation

signal is implemented in the manner ~~of the present invention~~
hereof.

If ignition switch 12 is switched to "off", EPB control device
5 14 determines from the signals received from operating state
device 8 that energy store 7 carries a sufficient charge. By
transmitting a corresponding control signal to engine control
device 10 (or by non-transmission of a control signal), engine
control device 10 determines that operation of drive motor 3
10 is able to be terminated immediately, and turns drive motor 3
off.

Accordingly, drive motor 3 is also shut down immediately once
ignition switch 12 has been switched off if detection device
15 18 determines that a predefined amount of an angle of
inclination (such as 5° or 8°, for ~~instance~~ example) is not
exceeded.

~~In an especially preferred specific embodiment, if~~ If ignition
20 switch 12 is switched off and motor vehicle 1 is not at a
standstill, EPB control device 14 ~~outputs~~ may output a
corresponding signal to engine control device 10, so that the
operation of drive motor 3 will not be terminated (and the
electric parking brake will not be activated either) until
25 vehicle 1 is stopped. The method ~~according to the present~~
~~invention~~ may be implemented in the manner described ~~in the~~
~~following text~~ below as soon as standstill has been reached.

If vehicle electrical system control device 8 detects that the
30 operating state of energy store 7 does not allow reliable
activation of the electric parking brake (for ~~instance~~
example, that the energy store is defective), if detection
device 18 detects that motor vehicle 1 is on steep terrain
(the amount of the pitch angle is greater than 5° or 8°, for

example), and if vehicle 1 is stopped, the following actions will be carried out:

When turning ignition switch 12 off at instant t_0 (illustrated in Fig. 2 as abrupt decrease in signal 1 from a high level to a low level), EPB control device 14 detects the described state of motor vehicle 1 and outputs a signal to engine control device 10, which induces it not yet to terminate the operation of drive motor 3. This is illustrated in Fig. 2 by a horizontally extending line M, which continues past instant t_0 at a high level. At the same time or subsequently, EPB control device 14 outputs a signal to an activation device ~~(not shown further)~~ for activation of the electric parking brake, so that the electric parking brake is activated beginning with instant t_1 and is fully activated at instant t_2 . This is illustrated in Fig. 2 by a line B, which rises from instant t_1 to instant t_2 . The electric parking brake then stays in the activated (engaged) state. A time span that corresponds to the interval between instant t_0 and instant t_3 at which engine control device 10 initiates the switch-off of drive motor 3 is predefined in engine control device 10 (for instance example, programmed). As indicated in Fig. 2 by a descending line M between instant t_3 and instant t_4 , drive motor 3 is turned off only after the interval has elapsed. The interval ~~is preferably~~ may be selected to be greater than the maximally possible duration of the activation of the electric parking brake, plus possible intervals that are required to carry out the described control measures. For instance example, as ~~shown~~ illustrated in Fig. 2, a short delay occurs until the activation of the electric parking brake begins at instant t_0 after ignition switch 12 has been turned off.

As an alternative, the activation device outputs a success signal to EPB control device 14 once the electric parking brake is fully activated.

5 Variants and further developments of the method ~~according to~~
~~the present invention~~ and the device ~~according to the present~~
~~invention~~ hereof are possible. For instance example, a
deactivation device may be provided, which is able to prevent
the execution of the method ~~according to the present invention~~
10 and/or which is able to deactivate (disengage) the already
activated electric parking brake without renewed starting of
the drive motor. In this way manner, it is possible, for
~~instance~~ example, to tow the motor vehicle even on steep
terrain. The deactivation device is directly connected to EPB
15 control device 14, for ~~instance~~ example, which controls the
operation of the electric parking brake accordingly.

ABSTRACT

A method and a device are for activating an electric parking brake of a motor vehicle, e.g., a road motor vehicle.

Initiation of a connection process is recognized for

- 5 disconnecting a drive motor of the vehicle when the vehicle is parked. The electric parking brake is initially activated after the initiation of the parking step, and the drive motor is disconnected thereafter. As a result, the drive motor may be used to activate the parking brake.